

# AIRS Post-Launch Algorithm Development and Validation Concept

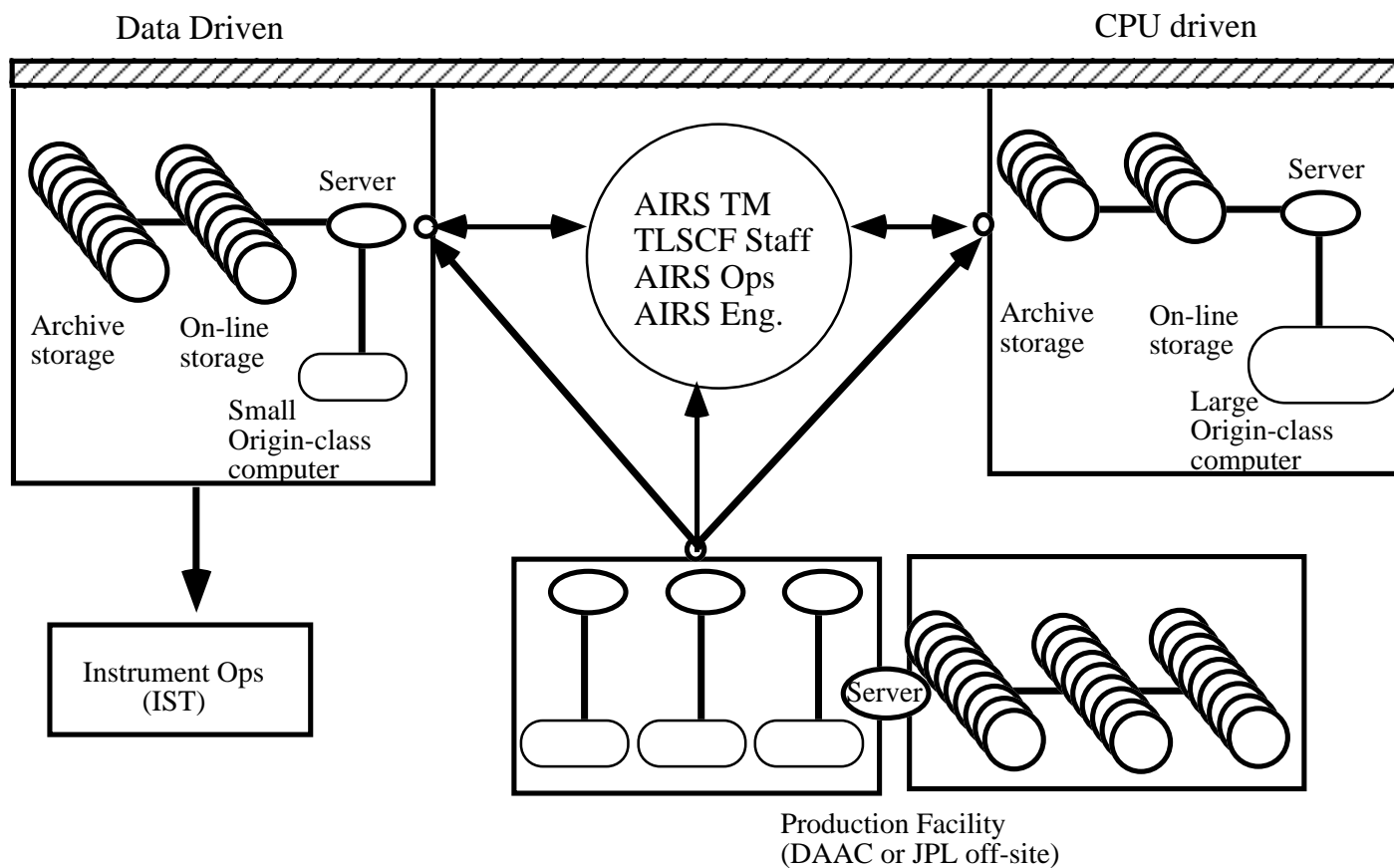
R. Haskins

## AIRS Validation Facility (AVF) Science Computing Facility

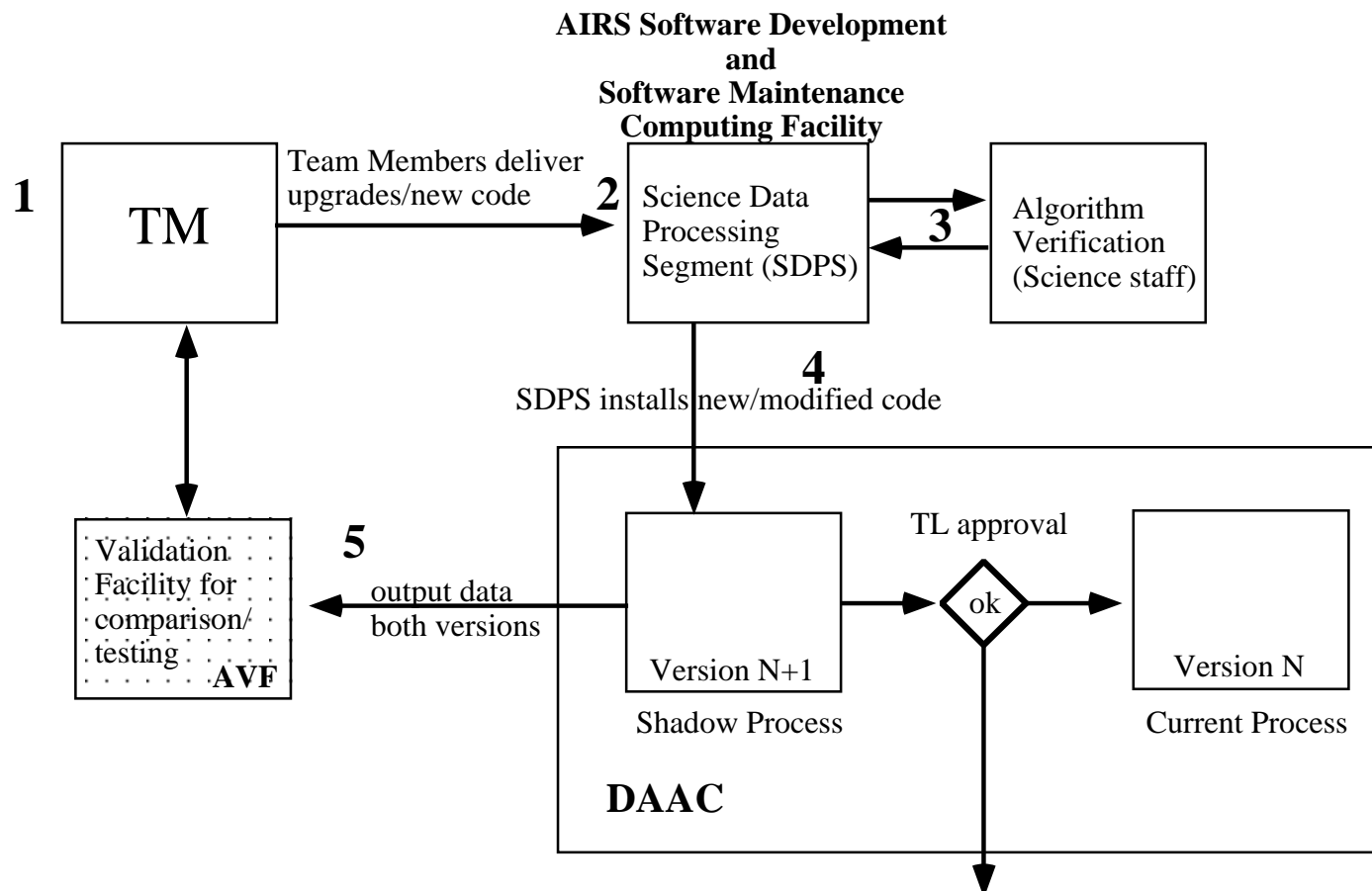
- short-term product & instrument analysis
- long-term product & instrument analysis
- browse display
- validation data access
- collaborative support

## AIRS Software Development and Software Maintenance Computing Facility

- Algorithm debugging and maintenance
- New core algorithm development
- New research product development
- DAAC-like environment



# Development Cycle Post-Launch



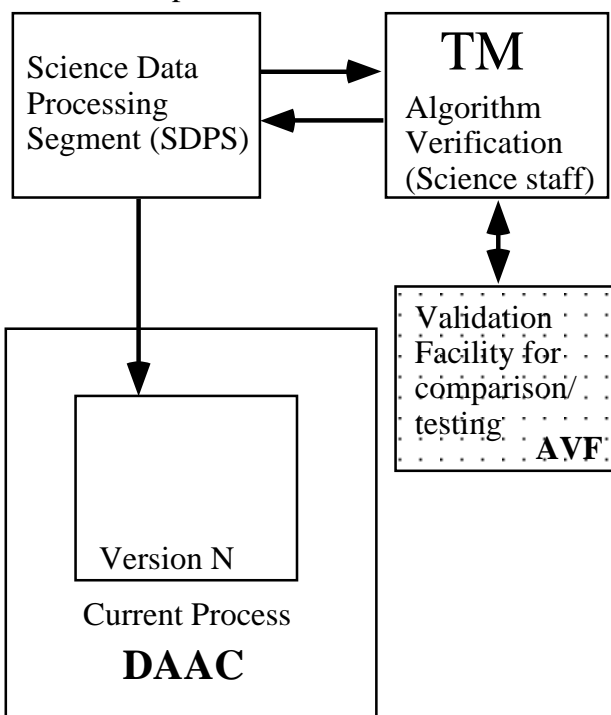
AIRS Algorithm Development and  
Algorithm Maintenance Computing Facility  
**Code Development Concept**

- For the purposes of algorithm testing and development, archive four 1-week global sets of AIRS L1A data during the first year. These are the baseline test sets. They may be further partitioned into smaller segments (regional, orbits to days). (780 GBytes)

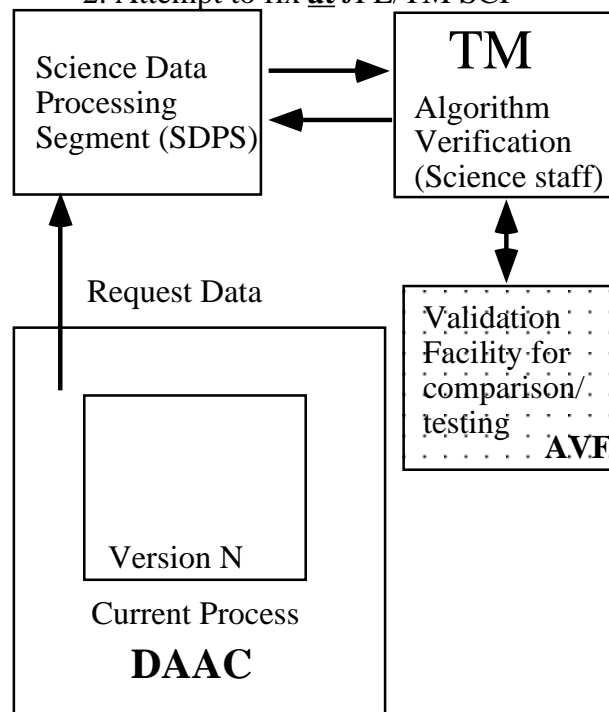
AIRS Algorithm Development and  
Algorithm Maintenance Computing Facility  
**Code Maintenance Concept**

- For diagnostic spot checking of the DAAC,  
1 orbit/week processed at the TLSCF
- For emergency bug-fixing
  - First step is to attempt to fix at the DAAC  
under the constrained controlled environment
  - If that fails, import enough L1A data to the  
TLSCF to work the problem ‘off-line’

## Bug detection

1. Attempt to fix at the DAAC

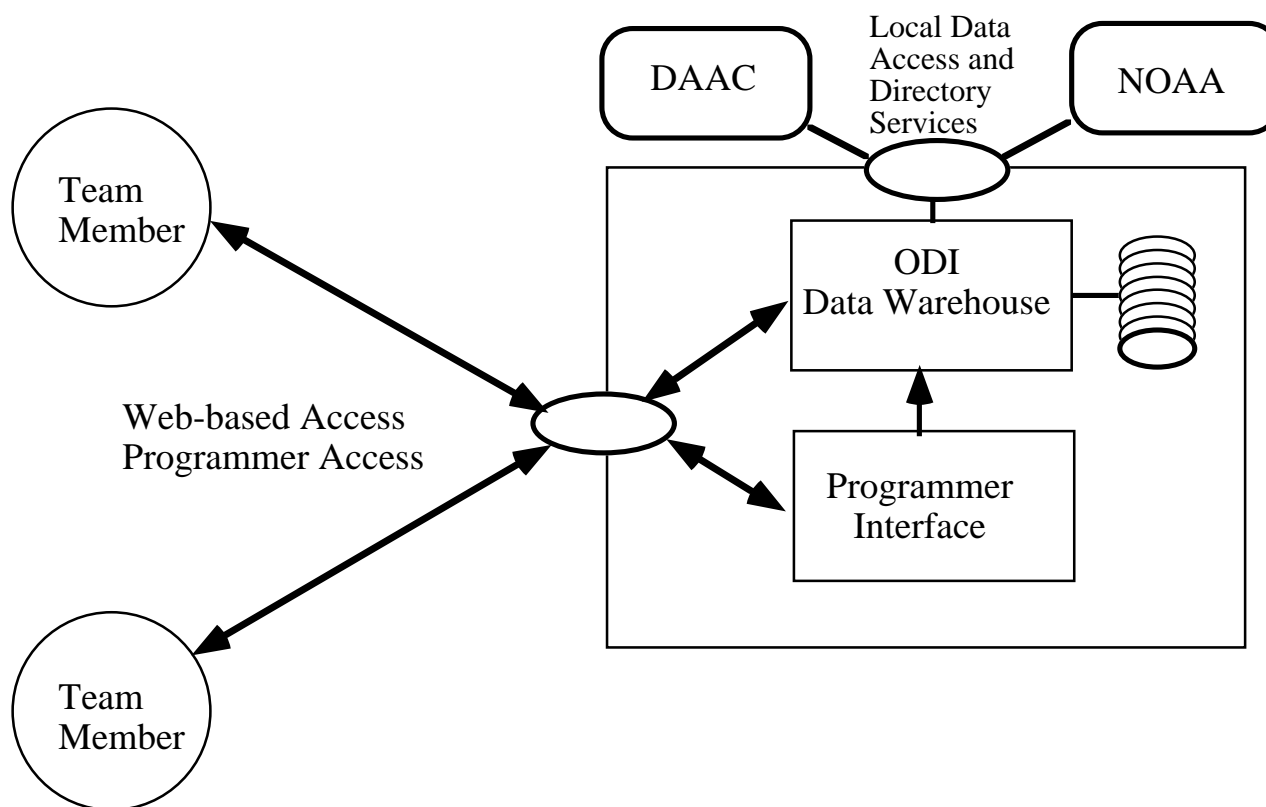
## Fixing broken Code

2. Attempt to fix at JPL/TM SCF

## 3. Plug in modification

# AIRS Validation Facility (AVF)

## Team Member Access



# Data Sets On-line Input

- CORR files
  - radiosondes + matchups (~300/day)
- Engineering data
- Calibration data
- Long Term trend data
  - About 15 monitoring sites around the globe
- AIRS VIS
  - Diagnostic flags, etc.

# Data Sets on-line

## Ancillary Input

- Model Data (NCEP/DAO)
  - NCEP Quality Control reports
  - Atmospheric profiles (Temp, Water, Ozone\_
  - Cloud fields, OLR
- Other EOS instrument data
  - MODIS products
    - Cloud products (MOD06, MOD08)
    - Cloud Mask (MOD35)
    - Precip water (MOD05, MOD08)
    - Atmospheric profiles (MOD07, MOD08)
    - MODIS Surface temperature (MOD11, MOD28)

# Data Sets on-line

## Ancillary Input

- CERES Data (SRBAVG Level 3 fluxes)
- AMSR Data
  - Subset of L1B and L2 products
- NOAA Operational Products
  - TOVS HIRS2, AMSU A/B, AVHRR
  - Ozone products
  - Aerosol product
  - NDVI, Snow/ice, EDC Land cover
  - Sea Surface Temperature

# Data Sets on-line Output

- Engineering quicklook
  - Engineering parameters
  - frequency shift parameters
- Calibration quicklook (AIRS-IR, AMSU-A, HSB)
- Radiance quicklook (All instruments)
- Quality Assessment
  - tuning parameters
  - daily coverage, error flags, rejects
  - Residual plots
  - retrieval plots

# Data Sets on-line Output

- Quality Assessment (con't)
  - Microwave intermediate products
  - VIS low clouds and variability indices
- Long term monitoring
  - Fixed site plots
  - CORR plots
  - Engineering trend plots
  - Calibration trend plots
  - bias, rms radiance plots
  - bias, rms retrieval plots

# Data

Requirement	Data Needed	data/day (MByte)	data/year (GByte)	data/mission (TByte)	Archived	FTP
<b>Totals</b>		<b>1940.4</b>	<b>245.47</b>	<b>1.23</b>	<b>on-line</b>	<b>619.8</b>
			<b>462.77</b>	<b>2.31</b>	<b>off-line</b>	
1. Long Term Trend	15 groups of 600 AMSU spots -L2 data, Cloud Cleared spectra	154.7	56.5	0.282	x=on	no
2. CORR files	300 Radiosondes/day					
	ANC_NOAA_SFC_OBS	14.0	5.1	0.026	x	yes
	ANC_NOAA_ARCFT_OBS	4.8	1.8	0.009	x	yes
	ANC_NOAA_RDSONDS_OBS	4.8	1.8	0.009	x	yes
	ANC_BUOY	1.0	0.4	0.002	x	yes
	L2 only, 3 AIRS L2	7.2	2.6	0.013	x	yes
	L2 + L1B	72.0	26.3	0.131	y=off	yes
3. Engineering Data	All collected	250.0	91.3	0.456	x	yes
4. Retrieval Statistics	All collected				x	
5. Subset Data	Drives On-line cache storage	142.0	51.8	0.259	y	yes
Browse Data		14.0	5.1	0.026	x	yes
6. Calibration Data	6 Cal footprints	70.9	25.9	0.129	x	yes
7. AIRS VIS	VIS data for diagnostic use	500.0	182.5	0.913	y	no

Requirement	Data Needed	data/day (MByte)	data/year (GByte)	data/mission (TByte)	Archived	FTP
8. Ancillary Data	a. Model Data NCEP/DAO					
	ANC_NOAA/NCEP_GAP	12.0	4.4	0.022	x	yes
	ANC_NOAA/NCEP_4DA	12.0	4.4	0.022	x	yes
	NCEP_QC	8.0	2.9	0.015	x	yes
	DAS05 Moisture Profile	20.0	7.3	0.037	x	no
	DAS11 Cloud Fraction	28.0	10.2	0.051	x	no
	DAS15 OLR	4.0	1.5	0.007	x	no
	DAS20 Temperature Profiles	60.0	21.9	0.110	x	no
	b. MODIS data (assume a sampling 1:144 reduction)					
	MODIS Cloud Products MOD06, MOD08	61.6	22.5	0.112	y	no
	MODIS Cloud Mask MOD35	22.0	8.0	0.040	y	no
	MODIS Precip water MOD05, MOD08* subset	77.0	28.1	0.141	y	no
	MODIS Atmos. Profiles MOD07, MOD08	1.8	0.6	0.003	y	no
	MODIS Surface Temp. MOD11, MOD28	66.2	24.2	0.121	y	no
	c. CERES Data					
	SRBAVG Level 3 fluxes and clouds	37.0	13.5	0.068	y	no
	d. AMSR data					
	Subset of L1B Data *** 366/day reduction 1/16	28.8	10.5	0.052	y	no
	L2 Products ***	15.6	5.7	0.029	y	no
	e. NOAA Operational Satellite Data					
	TOVS-HIRS2/SSU	28.9	10.5	0.053	y	no
	AMSU A/B	110.0	40.2	0.201	y	no
	AVHRR	105.0	38.3	0.192	y	no
	ANC_NOAA/NCEP_SST	1.4	0.5	0.003	x	yes
	ANC_NOAA/NESDIS_O3SBUV2	1.0	0.4	0.002	x	yes
	ANC_NOAA/NESDIS_AEROSOL_Product	0.2	0.1	0.000	x	
	ANC_NOAA/NESDIS_NDVI	0.3	0.1	0.001	x	yes
	ANC_NOAA/NESDIS_SNOW/ICE (1:225)	0.2	0.1	0.000	x	yes
	ANC_EDC_LANDCOVER (1:5)	0.6	0.2	0.001	x	yes
	ANC_EDC_DEM (1:5)	1.1	0.4	0.002	x	yes
	ANC_DCW_Land/Sea_Mask	0.2	0.1	0.000	x	yes
	ANC_NAVY_DATABASE	0.3	0.1	0.001	x	yes
	ANC_GSFC_O3TOMS	0.5	0.2	0.001	x	yes
	ANC_NSIDC_SNOW/ICE_PRDT	1.0	0.4	0.002	x	yes
	ANC_SMWLR	0.1	0.1	0.000	x	yes
	ANC_SMSST	0.1	0.1	0.000	x	yes

Requirement	Data Needed	data/day (MByte)	data/year (GByte)	data/mission (TByte)	Archived
		<b>Total</b>	<b>Total</b>	<b>Total</b>	
		<b>315.7</b>	<b>115.2</b>	<b>0.6</b>	
9.0 Validation Output Data	a. Short-term analysis data, quicklook, and browse				
	Engineering quicklook				
	Daily line plots of 20 engineering parameters	9.6	3.5	0.018	No
	Daily line plots of 2300 frequency shift coefficients	1.2	0.4	0.002	No
	pointing offsets plot	0.3	0.1	0.001	No
	Calibration quicklook				
	AIRS/VIS calibration data plot	0.5	0.2	0.001	No
	HSB calibration data plot	0.7	0.3	0.001	No
	AMSU calibration data	0.3	0.1	0.001	No
	Radiance quicklook				
	HSB (4 channels)	16.0	5.8	0.029	No
	IR Cloudy (5 channels)	20.0	7.3	0.037	No
	IR Cloud-cleared (15 channels)	60.0	21.9	0.110	No
	AMSU (8 channels)	32.0	11.7	0.058	No
	VIS (4 channels)	16.0	5.8	0.029	No
	Quality assessment				
	Daily line plots of 2300 tuning coefficients	1.2	0.4	0.002	
	Daily line plots of 2300 frequency tuning coefficients	1.2	0.4	0.002	
	Lat/Long plots of daily coverage maps	1.0	0.4	0.002	
	Lat/Long plots of error flags	4.0	1.5	0.007	
	Lat/Long plots of rejected retrievals	1.0	0.4	0.002	
	Radiance residual plots	4.0	1.5	0.007	
	Retrieved cloud parameters (2)	8.0	2.9	0.015	
	Retrieved surface parameters (4)	16.0	5.8	0.029	
	Retrieved water burden	4.0	1.5	0.007	
	Retrieved ozone burden	4.0	1.5	0.007	
	Retrieved temperature profile (9)	36.0	13.1	0.066	
	Retrieved moisture (4)	16.0	5.8	0.029	
	MW liquid water and rain rate	8.0	2.9	0.015	
	VIS low cloud and variability indices	8.0	2.9	0.015	
	ASCII output files of retrieval results	0.5	0.2	0.001	
	NCEP QA	0.5	0.2	0.001	
	b. Long term monitoring (monthly)				
	Fixed site plots (15)	2.0	0.7	0.004	
	CORR plots (200)	26.7	9.7	0.049	
	CORR ASCII output	0.1	0.0	0.000	
	Engineering trend plots	4.0	1.5	0.007	
	Calibration trends (4)	0.5	0.2	0.001	
	Tuning coefficient plots	1.6	0.6	0.003	
	Lat/long differences with auxillary data (20)	2.7	1.0	0.005	
	Lat/long bias with auxillary data (20)	2.7	1.0	0.005	
	Lat/long rms with auxillary data (20)	2.7	1.0	0.005	
	Lat/long EOF1 with auxillary data (20)	2.7	1.0	0.005	

# AIRS Validation Facility

## Requirements

- 1.0 Provide capability for evaluating instrument and algorithm performance through the use of short term trend analysis of L1 and L2 parameters and correlation studies of L1 and L2 parameters. Provide the capability of in-depth analysis of the measurement system at the individual footprint level. This includes high accuracy calibration and retrieval algorithms that make use of high accuracy but slow radiance calculators, generalized retrieval grids, and more accurate or more general numerical algorithm techniques. The time periods associated with this type of analysis are on the order of 1/4 orbit (the smallest granule) to approximately 26 orbits (2 days).
- 2.0 Calculate and provide display capabilities for quick-look, quality assessment, and browse data.
- 3.0 Provide long term monitoring capability for AIRS calibration procedures and Level 1B through 3 products.

# AIRS Validation Facility Requirements

- 4.0 Provide acquisition, access and data management of correlative data sets and their metadata as needed at all levels of validation. These include operational, campaign and research data, from in-situ and remote sensing instrumentation.
- 5.0 Provide access to data and tools for AIRS Science Team Members and TLSCF staff
- 6.0 Provide traceability of validation results and products.
- 7.0 Provide collaborative support for AIRS Science Team Members and TLSCF staff
- 8.0 Provide access and data management to all AIRS calibration data and metadata, both pre-flight and in-flight. Where possible, calibration data will be store in a machine readable format. Calibration data, especially pre-launch data is expected to be accessed infrequently and will be stored off-line.